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PROGRAM NUMBER
THIRTY-EIGHTH ANNUAL MEETING
OF
THE GEORGIA ACADEMY OF SCIENCE
AGNES SCOTT COLLEGE
DECATUR, GEORGIA
April 29, 1961

Local Arrangements Chairman — Netta Gray
Agnes Scott

BRING THIS PROGRAM WITH YOU TO THE MEETING

PROGRAM

SATURDAY, APRIL 29, 1961

MORNING

8:00-12:00	Registration
9:00-12:15	Section Meetings. Presentation of Papers and Election of Officers.
12:15-12:45	General Academy Business Meeting. Remarks by the President.
1:00- 2:00	Luncheon Available at Agnes Scott.

AFTERNOON

2:00- 3:30	Discussion-Debate: Is the Scientist Morally Responsible for the Use of His Discoveries? Participants to be announced.
3:30- 4:00	Tea by President Alston of Agnes Scott.

SECTION I

BIOLOGY

SATURDAY, APRIL 29, 1961—9:00 A.M.

Mr. William Brillhart, Presiding

Carbon Dioxide Effects on Glucose Dissimilation By Mixed Cultures of Sewage Organisms

P. E. GAFFNEY
Georgia Institute of Technology

Preliminary results have shown that aeration of sewage-glucose cultures with air supplemented with CO_2 resulted in shorter lag periods with respect to oxidative dissimilation. Conversely, the lag period increased when ambient air was scrubbed through KOH to remove the CO_2. Increasing concentrations of CO_2 in aerated mixed cultures results in shorter periods required for substrate stabilization.

12 minutes

Changes in a Granite Outcrop Community One Year Following Chronic Exposure to Low-Level Ionizing Radiation Gradients

FRANK McCORMICK and ROBERT B. PLATT
Emory University
(Introduced by Robert B. Platt)

An island community transplanted from Rollaway Mountain, a local granite outcrop, to the gamma radiation field on the Emory University Campus, received intensities of chronic low-level ionizing radiation ranging from 5-82r/hr from March to July, 1959. During this time the experimental community received an average of 15 hours radiation per day and accumulated total doses ranging from 8,000-130,000r. Control communities in the gamma field and on Rollaway Mountain received background radiation.

Low-level ionizing radiation had both immediate (McCormick, 1959) and long-range effects upon community attributes and individual species. This paper is concerned with the nature and causes of changes in community structure one year following radiation.

Changes in the summer-fall flora are interpreted as resulting from the selective elimination of more radio-sensitive species and the subsequent positive selection pressure toward more radio-resistent species.

Changes in the winter-spring flora are interpreted as resulting from a radiation conditioned environment in which *Arenaria* exhibited a capacity to dominate competition and thereby increase its density and distribution at the expense of *Diamorpha*, and emerge as the dominant species in the succeeding generations studied.

12 minutes

The Effects of Soil Moisture on Development of Pine Seedlings in Nursery Seedbeds

JACK T. MAY, HARVEY H. JOHNSON, and CHARLES S. WALSH
University of Georgia

In 1953, an investigation was conducted on the effects of irrigation on loblolly pine (*Pinus taeda L.*) seedlings grown in the Auburn Nursery in Alabama. In 1959, a second study was conducted on slash pine (*Pinus elliotti* Englem.) grown in the Herty Nursery in Georgia. The levels of soil moisture that prevailed during the two investigations did not significantly affect seedling growth.

The generally accepted concept that seedlings need about an inch of water a week from the time they are sown until late August or early September was not substantiated. Soil moisture tensions greater than 3 to 5 atmospheres may cause permanent wilting to three-month-old slash pine nursery stock, especially when the roots are within the upper five inches of the soil layer. Soil moisture tensions approaching 15 atmospheres or wilting percentage for a period of several days have no apparent detrimental effect on five- or six-month-old loblolly and slash pine seedlings growing in nursery seedbeds.

Supplemental irrigation of seedlings after an age of about three months or after the roots were longer than five inches did not affect the total number of seedlings produced, or modify the percentages of Grades 1 or 2 seedlings. The results indicate that soil moisture stress may have as great an effect on morphological development of seedlings as other factors such as seedling density and soil nutrients.

12 minutes

Nosocomial Staphylococcal Infections

T. W. KETHLEY
Georgia Institute of Technology

Currently nosocomial staphylococcal infections are emerging as a specific entity—that is, infections incurred by patients during their hospital stay, caused by antibiotic resistant strains of staphylococci found almost exclusively within the hospital. Representative data are given to show that the occurrence of these infections is probably worldwide. The primary factors appear to be an unfortunate maximization of the underlying requisites for epidemics: emergence of virulent or resistant microbial strains; development of healthy carriers or secondary reservoirs of infective agents; a susceptible population; effective routes of transfer of infective agents from carriers, infected patients or secondary reservoirs to the susceptible population. These factors are discussed and current efforts directed toward the elimination of nosocomial infections are indicated.

10 minutes *slides*

Bacterial Contamination of Air From Personnel

E. L. FINCHER
Georgia Institute of Technology

The characterization of the source of bacterial contamination and an evaluation of the nature, number, and size of the airborne bacterial particulates is essential to bacteriological studies of air hygiene.

The clothing and activities of staff personnel are examined under various conditions for the quantitative production of airborne bacterial particulates.

Determination of particle size distribution is calculated and significance of this factor together with aerial concentration is given in relation to the problem of intramural air hygiene.

10 minutes *slides*

Some Biology Textbooks in the U. S. A. Since 1900, A Bit of History!

MARY STUART MACDOUGALL
Agnes Scott College

20 minutes

Research Facility for Studies in Air Hygiene

W. B. COWN
Georgia Institute of Technology

Application of engineering principles to ventilation design of especially 'sensitive' areas, such as operating and surgical dressing rooms, within the hospital offers one solution to the problem of hospital-acquired staphylococcal disease. The design and operating characteristics of a special research facility for studying the effect of ventilation on transmission of airborne infectious material are described. A brief outline of an experimental condition and techniques of data-gathering is given.

10 minutes *slides*

The Effects of an Oxygen Gradient on Chromosomal Aberrations in *Tradescantia paludosa*

BETTY C. MOORE
Emory University
(Introduced by A. V. Beatty)

Anthers of Tradescantia paludosa were subjected to 400r of X-radiation administered at 400r/minute at 30° C., prepared as paraffin sections, and chromosomal aberrations of the dicentric and ring types were studied to determine whether an oxygen gradient existed within the anther. Atmospheres of 5% oxygen, air, 100% oxygen, and helium (anoxia) were used. Cross-sections of anthers were studied on the basis of three areas (outer, middle, inner) with data recorded from each circle separately. An analysis shows that in anthers irradiated in atmospheres of 100% oxygen and helium no gradient is apparent, whereas those anthers irradiated in atmospheres of 5% oxygen and air indicate a definite gradient with more oxygen being present in the outermost area.

12 minutes *slides*

Ozone and Xray-Induced Chromatid Deletions in Human Euploid Cell Cultures

R. H. FETNER
Georgia Institute of Technology

Washed KB strain cell cultures were exposed to various concentrations of ozone in oxygen for specific increments of time. Twenty-four hours later

metaphase cells were harvested and slide preparations used to determine the number of chromatid deletions. Another experimental group was irradiated with 50, 100 and 200 r of 250 KV x-rays. Ozone produced chromatid deletions as an exponential function of dose (contact time), while irradiation yielded a linear or one-hit kinetics response.

12 minutes *slides*

Observations on the Effect of Mechanical Pressure on *Paramecium caudatum*

EVAN DWAIN PORTER
Georgia Institute of Technology

If *Paramecium caudatum* is placed in a microcompressor and oriented so the buccal cavity is not obstructed by the slide or coverslip the buccal cavity can be made to evert. Sufficient pressure causes complete eversion so that the buccal organelles are outside the body. If the pressure is too great the cell will burst, usually at the point where the food vacuole forms.

If an organism is obtained just before migration of the mouths at fission and is placed under pressure both mouths will evert. They are arranged in tandem with the old mouth in front. As the fission line deepens it is seen to go behind both mouths resulting in an astomatous opisthe and a bistomatous proter. The mouths do not migrate so when separation occurs after the pressure is released the two mouths are located near the posterior end of the proter.

A change in shape of the organism occurs at the time when migration of the anterior buccal cavity should take place. It appears there is an anteroposterior contraction because the length decreases and the width increases. A cortical contraction may be part of the mechanism by which the buccal cavity normally migrates during fission and porphogenesis.

12 minutes *slides*

Survival of *Nippostrongylus muris* Larvae in Vitro

ALEXANDER J. SULZER
Emory University
(Introduced by C. G. Goodchild)

Larvae of *Nippostrongylus muris*, a nematode intestinal parasite of the rat, were stored under tap water in glass dishes for up to 116 days. Living larvae were present in these cultures at the end of the storage period. Larvae were taken from cultures at intermediate and terminal times and inoculated into rats that had no prior exposure to this nematode. Fecal examinations were carried out on all the rats for periods of up to two weeks, using brine flotation for detection of eggs and charcoal culture to test viability. In all cases eggs appeared in the rats' feces about one week after inoculation. These eggs produced infective larvae on culture. The possible relationship of this lengthy larval survival to the life cycle of *N. muris* under natural conditions is discussed.

10 minutes

SECTION II

CHEMISTRY

SATURDAY, APRIL 29, 1961—9:00 A.M.
Dr. W. H. Waggoner, Presiding

Function of Trace Elements in the Form of Enzymes

A. A. NIKITIN
Tennessee Corporation

The essential value of nutrient elements for plant growth is attributed to their function as enzymes. The function of trace elements in plant metabolism is related chiefly to the oxidation-reduction processes. Chemically enzymes represent proteins containing elements as cations, without which enzymes are inactive. Enzymes are specific in their action, i.e., each enzyme acts only on certain types of organic compounds. Various enzymes require different kinds of electrolytes, such as iron, manganese, copper and zinc. Manganese and iron serve as activators for certain enzyme systems, such as dehydrogenases and carboxylases. Trace elements may be furnished to soil or foliage, depending upon the type of soil and plants. Trace elements for soil treatment should be applied early in the season for foliar treatment as a spray. On alkaline soils and those containing high organic matter the foliar treatment is most effective.

The interference between trace elements is effectively utilized to reduce the toxic effect of some elements, i.e., if molybdenum is present in a pasture soil above 10 ppm it causes severe toxicity to animals. Copper in this case is very effective in overcoming molybdenum toxicity and iron is effective against arsenical toxicity.

20 minutes

A Comparison of the Reaction of Sodium Fluoride and Potassium Fluoride with Ammonium Fluoride

J. C. SIMMS, North Georgia College

The reaction: $NH_4F + KF = NH_3 + KHF_2$, occurs readily when two solids are heated together but the reaction: $NH_4F + NaF = NH_3 + NaHF_2$, does not occur nearly so readily or completely. Why the difference?

10 minutes

The Interaction of Argon with Hexagonal Boron Nitride

R. A. PIEROTTI and J. C. PETRICCIANI
Georgia Institute of Technology

X-ray diffraction studies show that the hexagonal modification of boron nitride has a crystal structure which is remarkably similar to that of graphite. It seemed desirable, therefore, to compare the physical adsorptive properties of the two substances.

The energy of interaction of argon with hexagonal boron nitride was calculated for four different positions over the basal plane of boron nitride. The calculations were carried out by assuming a Lennard-Jones (6-12)

potential and numerically summing this potential over the atoms of the adsorbent. It was found that the boron nitride surface was essentially energetically homogeneous with respect to the adsorption of argon. An adsorbed argon film on this surface would be expected to be non-localized or mobile, and the heat of adsorption at 85°K would be about 2060 cal/mole. Ross and Pultz measured isotherms of argon adsorbed on boron nitride and found the heat of adsorption to be 2300 cal/mole at about 85°K. Their data also indicates that the adsorbed argon film is mobile.

The calculated and experimental values for the argon-boron nitride system are compared with those for the argon-graphite system. Their physical adsorptive properties are found to be almost identical in spite of the great differences in their electrical properties (graphite being a conductor and boron nitride an insulator). It is concluded in agreement with previous work, that insofar as the physical adsorption of monatomic molecules is concerned, metals and nonmetals are indistinguishable as a class from one another.

20 minutes *slides*

Spectrophotometric Determination of Rhodium with p-Nitrosodimethylaniline

RAYMOND B. WILSON and WILLIAM D. JACOBS
University of Georgia

The color reaction between rhodium (III) and p-nitrosodimethylaniline has been studied to determine the optimum conditions for the analytical use of the reagent. The absorbance curve of the colored complex shows the complex to have a peak at 510 mu. The reaction is carried out at a pH of 4.4 and is heated in a water bath at 90° C for 10 minutes to develop the color. Beer's law is obeyed by the system over the range investigated, 0.15 to 1.06 p.p.m. The sensitivity of the reaction is 0.0015 cm^2 at 510 mu. Interferences of other platinum metals have been investigated.

Separation of Iridium from Rhodium by Extraction with Tributyl Phosphate

RAYMOND B. WILSON and WILLIAM D. JACOBS
University of Georgia

A procedure based upon the extraction of Ir(IV) into tributyl phosphate is being investigated as a method for the separation of milligram quantities of Ir(IV) from microgram quantities of Rh(III). The Ir(IV) appears to be quantitatively extracted into the tributyl phosphate layer from aqueous solutions which are approximately 7.5M in hydrochloric acid. The rhodium content in the aqueous phase is determined spectrophotometrically with N,N'-bis(3-dimethylaminopropyl)dithiooxamide. Preliminary studies indicate that the procedure will offer an excellent method for rapidly separating large quantities of iridium from relatively small amounts of rhodium.

15 minutes *slides*

Selected Derivatives of Dithiooxamide as Reagents for the Spectrophotometric Determination of Platinum and Palladium

JOHN T. PYLE and WILLIAM D. JACOBS
University of Georgia

Platinum (II) and Palladium (II) are known to form complexes with certain organic reagents. A class of these reagents includes dithiooxamide and some of its derivatives.

The absorption spectra of the complexes of Pt(II) and Pd(II) of dithiooxamide and certain symmetrically and unsymmetrically substituted derivatives have been obtained. Attempts are being made to correlate the structure of the organic molecule with its reactivity towards the metal ion. Optimum conditions of acid concentration for the formation of these complexes have been determined. Several of the most promising reagents for the simultaneous determination of platinum and palladium are being investigated.

15 minutes *slides*

SECTION III

EARTH SCIENCES

SATURDAY, APRIL 29, 1961—9:00 A.M.

Dr. Willis A. Holland, Presiding

Inarticulate Brachiopods from the Floyd Shale, Georgia

HOWARD ROSS CRAMER
Emory University

A large marine fauna from the Floyd shale, near Floyd Springs, Floyd County, contains at least two genera of inarticulate brachiopods, neither of which has been previously reported. The genera *Petrocrania* Raymond and *Orbiculoidea* d'Orbigny are present, both of which are long-ranging and stratigraphically useless. The *Petrocrania* are attached to valves of productid brachiopods and the *Orbiculoidea* are free. The latter are more common. *Lingula* has been reported from the Floyd shale, but not from this area.

Physical and Chemical Properties of the Fall-Line Kaolins of Georgia

JAMES MADDOX, JR.
Atlanta, Georgia

An area containing large deposits of white clay is located in Twiggs, Wilkinson, Washington, and Glascock Counties in east-central Georgia. This clay, kaolin, Cretaceous in age, is in the Tuscaloosa formation. The Tuscaloosa is generally overlain disconformably by the upper Eocene Barnwell formation, although at some localities the lower Eocene McBean formation is found between the Tuscaloosa and the Barnwell.

The kaolin and the Tuscaloosa formation are remarkably free of disseminated iron compounds even though ferruginous concretions are present in both. The overlying Eocene strata are iron-stained.

Laboratory and field studies have suggested conclusions, which, while preliminary, seem to be reasonably valid. The varying hardness of the

kaolin has a direct relationship to the SiO_2-Al_2O_3 ratio; the hardness is also a function of the clay-particle size. The white color of the clay is due to its purity; the lack of iron-compounds is most notable and could be explained by the presence of organic and/or carbonic acids during the deposition. The ferruginous concretions may be the result of local precipitation of iron disulphide around nuclei resulting from decaying organisms. The depositional environment was probably quiet, fresh water.

Strontium-Barium Content of Georgia Carbonates

VERNON J. HURST and WILLIS A. HOLLAND, JR.
Department of Mines, State of Georgia

Spectrochemical determinations for twelve carbonate rocks, Cambrian to Miocene, give 33 to 613 ppm Strontium and 8 to 220 ppm Barium. For these rocks, the Sr/Ca ratio varies less with geologic age than with other factors.

The Murphy marble has a more variable Strontium content and lower Barium content than the Brevard marble. If these two rocks are the same age either their depositional conditions or their post depositional history must be different.

Geology of the Barnesville Area, Lamar County, Georgia

WILLARD H. GRANT
Emory University

An area of approximately 40 square miles has been mapped. Four rock units distinguished: a quartzite, a biotite gneiss, an amphibolite-bearing biotite gneiss and a sillimanite-bearing muscovite-biotite schist.

The outcrop pattern is arcuate. Rocks strike northeast along the western Lamar county line and slowly change to a northwest strike east of Barnesville. Dips are almost exclusively to the north.

Evidence of faulting with varying intensity occurs north of the quartzite. This area contains many minor faults as well as the major Towaliga fault. The latter transects the arcuate pattern of the country rock and continues in a northeasterly direction.

The Oldest Indian Mound in Georgia

A. R. KELLY
University of Georgia, Athens

During the last two years, the University of Georgia field party doing salvage archeology in the Chattahoochee river basin, where numerous archeological sites are soon to be innudated by the reservoir of the Walter F. George dam, has explored a large mound and village site (the Mandeville site) near Ft. Gaines, Georgia.

Mound A of this group has been found to belong in its earliest period of construction to an early mound builder culture known as Swift Creek, first described by A. R. Kelly in 1938 on the Ocmulgee river near Macon, Georgia. The pottery of these people is remarkable for its complicated designs. The Swift Creek mound at Macon was a series of domiciliary structures built one upon another but without special summit constructions and other features reminiscent of the much later mounds, denominated temple mounds of the Mississippian cultures.

Mound A, Mandeville, truncated by modern plowing but still 16 feet high, had been constructed over a heavy premound village area belonging to a still earlier cultural provenance, known in northwest Florida and the Georgia coast, as the Depthford culture. At the base of Mound A, built directly over nearly two feet of village midden, were constructed small rectangular mounds, so-called primary mounds, which are determined to be the oldest mound structures known to immediate southeastern archeology.

Mound B, the second mound at the Mandeville site, was explored and found to be a burial mound, with the initial elements consisting of primary mounds sutured together, with special burials around the peripheries and intruded. Burials were frequently cremated, sealed in gravel, with burial furniture of copper beads, copper Pan's pipes, monitor pipes, galena cubes, flint flake knives, and other traits which relate the burial customs and mound building traits to similar associations found hitherto in the upper Mississippi region of Ohio, Illinois, Indiana, part of the famous Hopewell mound complex. The Hopewell mound culture is dated from many carbon 14 specimens at different sites to an 800 year span, roughly 300 B.C. to 300 A.D.

Carbon dates at Mandeville, from the premound village area, go back to 1960 ± 150 years. Carbon 14 samples were not secured at the original or type site of Swift Creek culture at Macon.

The tie in of Swift Creek and Deptford occupations at the Mandeville site with Hopewell in the upper Mississippi, 1000 miles away, argues for direct cultural contact and important trade relations over a wide area.

SECTION IV

PHYSICS, MATHEMATICS AND ENGINEERING
SATURDAY, APRIL 29, 1961—9:00 A.M.

Mr. R. B. Belser, Presiding

X-ray Studies of Dauphiné Twinning in Quartz

JUDE H. KOENIG and R. A. YOUNG
Georgia Institute of Technology

Dauphiné twinning, which amounts to an 180° rotation of the twin about the c-axis, cannot be observed by ordinary polarizing-optics methods. Specular reflection from properly etched surfaces may show up twin boundaries which intersect the surface of the crystal. Certain x-ray reflections are affected, some profoundly, by the presence of these twins whether or not they either intersect the surface or are of macroscopic size.

An x-ray method making use of this effect has been employed in a preliminary study of several aspects of the occurrence of Dauphiné twinning. The method will be described. Some of the effects on Dauphiné twinning of thermal cycling will be discussed and evidence for the possible occurrence of microscopic or submicroscopic twinning will be presented. The significance of such twinning behavior to piezoelectric applications and to crystal structure studies will be mentioned.

20 minutes *slides*

The Use of Anthracene as a Solid-State Radiation Detector*

H. J. FULLBRIGHT, III, B. L. BLANKS, R. H. ROHRER
Emory University

The measurement of the absorbed radiation dose received by the human body requires that the dosimeter be of tissue-equivalent material. Anthracene approaches this requirement and has been used successfully for scintillation crystals. The photoconductivity of anthracene has been noted, but, to date, little practical use has been made of it. This dosimeter utilizes this property to measure absorbed dose. The crystal, with suitable electrodes and guard rings, passes small currents when irradiated with x-rays in the therapeutic and diagnostic range. The current is dependent on the intensity and spectral distribution of the radiation, and on the field across the cell. The cell is described and the results are presented.

*This work is supported by the United States Public Health Service.

15 minutes *slides*

Millimeter Wave Spectrum of Deuterated Methyl Bromide

K. H. CRUMBLY and A. K. GARRISON
Emory University

Previous work* on the pure rotational spectrum of d-methyl bromide has given values of the rotational constant B_0, D_{JK} and the quadrupole coupling constant eQq. In an effort to obtain better values of these constants and obtain a value of D_J, the rotational stretching constant, measurements have been extended to the transition of J 5→6 and J 7→8. These transitions occur around 92,000 mc/sec and 122,000 mc/sec, respectively. A standard video type spectrometer using 4th and 5th harmonics of a K-band klystron tube was employed.

Preliminary analysis of the date gives the following values for the constants:

eQa	DJK	
	0.0635	
	0.0632	in mc/sec.

*Simmons and Goldstein, J. Chem. Phys., 20, 122, (1952)
James Hilley, Thesis (Unpublished), Emory Univ. (1956)

10 minutes *slides*

Spectral Line Width Determination by Recording Fabry-Perot Interferometer Technique

DONALD NORMAN
University of Georgia

Recent progress in the production of multilayer dielectric coatings giving very high reflection coefficients with extremely low absorption and in the production of narrow-band interference filters has enlarged the practical use of the Fabry-Perot interferometer. The interferometer with its high resolving power provides an effective instrument for measuring spectral line widths.

Interference fringes formed by the etalon plates are swept across a scanning slit by varying the pressure between the interferometer plates and are detected by a photomultiplier. The line profile is then recorded. The feasibility of using the photoelectric Fabry-Perot interferometer to measure the temperature of the upper atmosphere will be discussed. Work was supported by the Air Force Cambridge Research Center under Air Force Contract No. 19-(604)-6163.

15 minutes

Detection and Measurement of Spherical Luminous Waves Produced in the 100 km Region of the Upper Atmosphere

MELVIN CAPPS and H. D. EDWARDS
Georgia Institute of Technology

During the summer of 1960, thirty-three rocket probes were sent into the upper atmosphere between the altitudes of 75 and 150 km. An explosive mixture was released and the luminous waves produced were observed visually from the ground.

The instrumentation used to record the spherical luminous waves is described and the growth rate of the waves presented.

10 minutes *slides*

Analysis of the Observed Growth of Spherical Luminous Waves Produced in the 100 km Region of the Upper Atmosphere

L. C. YOUNG and H. D. EDWARDS
Georgia Institute of Technology

Rapidly expanding luminous waves, described in the previous paper, are reviewed and discussed from a theoretical viewpoint. The rate of expansion of these spherical bursts is examined in light of what is known about the ambient conditions at the altitude of burst, to indicate possible methods of propagation. The results are then analyzed from the standpoint of experimental and theoretical findings of others in this field.

15 minutes *slides*

Position Determination from Star Backgrounds of Luminous Clouds in the 100 km Region of the Atmosphere

D. L. ALBRITTON and H. D. EDWARDS
Georgia Institute of Technology

A method of determining accurate three-dimensional position data on luminous clouds between 75 and 150 km will be discussed.

Applications of the method to a determination of wind velocities and atmospheric diffusion will be indicated.

10 minutes *slides*

Wind Velocities in the 100 km Region of the Atmosphere

R. N. FULLER and H. D. EDWARDS
Georgia Institute of Technology

Data on wind velocities in the altitude region between 75 and 150 km will be presented and discussed.

15 minutes *slides*

Cesium

PATTY NICKEL
Agnes Scott College

Cesium, a metal of low melting point (28.7°C), has found versatile employment in various fields of physics. These range from such prosaic uses as "gettering" of gases in electronic tubes to the glamorous possibility of use as a fuel for the ion-propulsion of space craft. Employment as a photosensitive electron emitter in photomultiplier tubes, as a thermoelectric emitter on vacuum tube filaments, as the ion beam in the "Atomichron" and as a radiation source of high intensity, the radioactive isotope, Ce 137, signify its versatility. Under consideration also is its use as a thermal transfer liquid. The properties and principal uses of cesium will be discussed.

10 minutes

Demonstration Equipment for Courses in Astronomy

W. A. CALDER
Agnes Scott College

Now that astronomy has attained status as a subject for study in colleges and engineering schools, thought should be given to the matter of demonstration equipment in a way similar to that in which the American Association of Physics Teachers fosters the concoction of new devices for teaching physics. The situation is more acute in astronomy owing to the lack of ability to control an experiment, plus the perpetual frustrations of weather when observing projects are undertaken. But if we cannot manipulate, we can simulate; and we can reproduce in a few minutes events which would take place in a matter of weeks. Two arrangements have been devised which give insight into the study of variable stars. In one, a class is enabled to make a visual light-curve of a Cepheid based upon independent estimates of brightness in a sequence and manner identical with the actual procedure. In the other, a photoelectric telescope traces the light-behavior of an eclipsing binary system in a way that reveals the relative sizes, surface and total brightnesses of the stars. These and other gadgets will be shown to members of the Georgia Academy of Science for the first time at the Agnes Scott College site since they cannot be used effectively when transported.

10 minutes

The Present Status of the Problem of Stellar Distances

MARY JIM CLARK
Agnes Scott College

Fundamental in the study of our galaxy and expanding universe is the problem of the determination of stellar distances. The distances of only 170 celestial objects, all lying within 30 light-years of the earth, have been determined with an error of less than ten per cent. Trigonometric parallax is uncertain at distances greater than 60 light-years. The use of cepheid variables and spectroscopic parallax to determine absolute magnitude has extended our knowledge to distances within a few thousand light-years of the earth.

A new index to the absolute magnitude of more distant stars has been found by O. G. Wilson in his study of the calcium absorption spectra of many cool stars. By establishing a relationship between absolute magni-

tude and the width of the bright emission component found in the K absorption line, he has been able to determine distances to a greater degree of accuracy. This latest answer to a vital problem is of immediate benefit in extending our knowledge of the universe and opens the door to further investigation of the composition of stars and the age of our galaxy.

10 minutes

The Cause of the Slow Down of Moving Clocks

NIELS ENGEL
Georgia Institute of Technology

According to modern physical theories it is postulated that space shortens, time slows down, mass is increased on moving bodies and moving particles exhibit wave properties. Since no physical forces or effects are known which are able to influence space or time and since no effects or mechanisms are known able to create waves in the wake of moving particles, these processes remain unexplained. Modern physical theories, therefore, are as scholastic as the ptolemaic universe. An explanation of the mechanism causing these basic phenomena will convert modern physical theories from scholasticism to a scientific foundation.

The author presents a particle model explaining all the basic phenomena based on very few assumptions. The model presents the mechanism causing all processes (not time) to slow down, rods to shorten (not space), the phenomena causing the moving particle to exhibit wave properties, etc. The mathematical formulas accounting for the slow down, shortening, and the mass increase as well as the wave length of the mass-wave are deduced from the model. The relativistic appearance of these phenomena are explained.

20 minutes *slides*

SECTION V

PHILOSOPHY AND HISTORY OF SCIENCE
SATURDAY, APRIL 29, 1961—9:00 A.M.

DR. JON JOHNSTON, Presiding

John Ledyard: Early American Traveler

SANFORD H. BEDERMAN
Georgia State College

The discipline of geography owes a great debt to an array of adventurous travelers, who wandered through, and later wrote about, lands little known to the general public in Western Christendom. From their early accounts, modern geographers have been able to relate landscape changes (both physical and cultural) that otherwise would not have been discerned. One of these tenacious individuals was John Ledyard (1750?-1788), who was probably the most widely traveled man of his day. He was with Captain James Cook on the Third Voyage to the Pacific and wrote the first published account of the trip; he attempted to cross Russia and reached Yakutsk before he was arrested and banished from the country; and he was the first scientific explorer employed by the famous African Association to conduct research in the Dark Continent.

Aesthetics and Science

ERWIN M. BREITHAUPT
University of Georgia

This paper will be concerned with the following points:

1. An analysis of the characteristics of aesthetics as a science.
2. A discussion of the factual possibility and usefulness of a scientific aesthetics.
3. A discussion of the logical possibility of a scientific aesthetics.

The Emergenc of the Modern Concept of Causality

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Emory University

This paper undertakes to examine the influence of such intellectual traditions as 16th century Aristotelian medicine, the reconcilers of Plato and Aristotle, and the Paduan- Aristotelians upon the emergence of the modern concept of causality.

ALL SECTIONS

GENERAL

SATURDAY, APRIL 29, 1961—2:00 A.M.

Discussion—Debate

Topic: Is the scientist morally responsible for the use of his discoveries?